The neurological examination technique for toddler-age.

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CHAPTER 9

SUMMARY

Toddlers are children between 1½ and 4 years old. Children in this age period are often un-cooperative and difficult to examine. In this thesis the development and standardisation of a neurological examination technique for toddlers is presented. The assessment technique was developed in order to assess also minor neurological dysfunctions. At first sight toddler-age appears to be a 'silent' period during which hardly any important motor function is added to the repertoire. Yet during toddling age the quality rather than the quantity of the motor functions changes. An abnormal development of qualitative aspects of motor functions can be detected by careful observation.

In the second chapter some develelopmental tests, neurological examination techniques for children and a few specific studies of the development of specific neurological functions are discussed. The conclusion of the chapter is that an age-specific neurological examination technique for toddlers which aims at the for this age period typical aspects of the sensorimotor system, is lacking.

The development of the examination technique and the collection of normative data are described in chapter 3. The normative data were collected in a combined cross-sectional and longitudinal study of a group of normal children. In the cross-sectional study 305 normal healthy toddlers were examined. These children were aselect recruited at Infant Health Care Centres in the city of Groningen. The children were assessed at the age of 1½, 2, 2½, 3, 3½ or 4 years. The children of 1½ years old were re-examined every six months as part of the longitudinal study. A small group of children with an increased risk for neurodevelopmental dysfunctions was examined in order to assess the discriminative power of the examination technique. This at risk group consisted of 43 children; more than half of them were born prematurely. A few children were referred to us because of a suspicion of a neurological dysfunction. None of the at risk children were overtly handicapped.

In the fourth chapter the development of the examination technique and the scorelist are presented. The typical behavioural characteristics of toddlers and the qualitative changes of the motor functions warranted an observational technique. The observation took place in a standardized free

field situation in which toys and games are presented to the child in a standardized manner and sequence. A semi-quantitative score list was developed to assess the qualitative aspects of the motor functions (prehension, sitting, crawling, standing and walking). The interscorer agreement was assessed as part of the validation of the scorelist.

A description of the examination equipment and the flow of the assessment is given in chapter 5. The examination consists of history taking, followed by observation of the 5 motor functional areas prehension, sitting, crawling, standing and walking. At the end of the assessment an examination of the head and a manipulative examination take place. Finally, the head circumference, length and weight are measured. After the examination is completed a conclusion can be drawn which may lead to further diagnostic tests, follow-up and therapy.

In chapter 6 the items of the scorelist are presented. Of each item the procedure, recording and normative data based on the normal cross-sectional groups are given. Also the data of the at risk group are presented for comparison. With each item a short comment is given in which the relevance of the item, the (age dependent) abnormal scores and possible explanations are included. In the normal group in all motor functions an increase of the fluency and adaptability of the movements was found. In general in the at risk group the motor performances was less fluent and lacked variability and adaptiveness. The qualitative changes appeared to be delayed or absent in these children. In the final part of this chapter the summary of the examination and the interpretation of the items are presented. The items are divided on the basis of their neurological function and fitted into a neurological profile.

From the complete examination a concept for a screening has been derived which can be used in the Infant Health Care Centers. The screening (chapter 7) consists of 15 items which can be expected to have an (a-specific) abnormal score in case of a neurological dysfunction. The screening does not lead to a diagnosis but merely to a conclusion 'normal' or 'suspect' . In the latter situation a complete examination should take place.

In chapter 8 the sensorimotor development of toddling age is discussed. The qualitative changes are so impressive that they can be called a 'transformation' of neural functions. Between 1½ and 4 years the primary variability of infancy changes into secondary or adaptive variability. The child develops the ability to perform a motor task in different manners adapted to the circumstances. Distinct motor plans are adequately selected, automatized and integrated into differentiated and efficient motor

programmes. This developmental process is a prerequisite for the development of motor skills at school-age. Many items of the presented examination technique change statistically significantly with age. Yet the correlation-coefficients of the items with age are low, as are the correlation-coefficients between items in a certain age-group. We conclude that the items measure different (aspects of) neural mechanisms which change indepently from another. In the developmental changes of toddling age the age of 2½ years plays an important role. Before the age of 2½ years the changes in the motor repertoire seem to be related to the development of balance control. From 2½ years omwards a further differentiation of the motor performances with increasing efficiency occurs. Some neuro-anatomical changes which may be related with the transformation of the neural functions are mentioned.

Conclusions:

1. Toddlers can be examined neurologically if the method and technique are age-adequate. This implies an assessment based on observation of a free playing child in a standardized free field situation. Qualitative aspects of the motor functions can be assessed with a semi-quantitive scorelist.
2. The presented examination technique can be used to detect minor neurological deviations or retardations.
3. During toddler-age a qualitative change of the motor functions occurs in which the motor performance becomes more differentiated, efficient and fluent. The primary variability of infancy changes into the secondary adaptive variability. These
changes are based on a transformation of neural functions. Neither functionally nor anatomically is the toddler-age a 'silent' period.